Phase II Work Plan
Preliminary Study Area
Boise, Idaho

3/6/95 1.2

Prepared for

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HLA Project No. 20783 007

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1.0 INTRODUCTION

Harding Lawson Associates (HLA) has prepared this Phase II Work Plan for Van Waters & Rogers Inc. (VW&R), Kirkland, Washington, to describe the activities planned in an area of West Boise known as the Affected Area (AA; Plate 1). The AA is downgradient (northwest) of the Boise Towne Square Mall (Mall) and is defined as the area where groundwater contains perchloroethylene (PCE) above the EPA's maximum contaminant level (MCL) of 5 micrograms per liter (μg/l). The purpose of this proposed investigation is to provide additional chemical and hydrogeologic data to address data gaps identified during the Phase I investigation. This Work Plan has been prepared to meet the requirements of the Preliminary Study Area (PSA) Consent Order dated October 9, 1992 (PSA Order), between VW&R and the Idaho Department of Health and Welfare, Division of Environmental Quality (Department).

The general scope of work for the Phase II investigation was originally presented in *Exhibit 1, Work Plan, Preliminary Study Area Investigation, Boise, Idaho* (*HLA, 1992a*). This Work Plan provides the details of the proposed Scope of Work which includes installing and sampling five monitoring wells, collecting and analyzing Hydropunch samples from four borings, installing five piezometers to collect groundwater elevation data, installing three staff gauges to collect surface water elevation data, conducting a geophysical investigation, and analyzing the data.

The scope of work for this investigation is presented in Section 2.0. An implementation schedule for the proposed investigation is presented in Section 3.0, and references cited in this Work Plan are listed in Section 4.0. The field and laboratory procedures to be used for work activities outlined in this Work Plan are described in the Quality Assurance Project Plan (QAPP; *HLA, 1992b*).

2.0 SCOPE OF WORK

Based on the results of the Phase I investigation, several data gaps were identified. Although the areal extent of PCE-impacted groundwater was defined during Phase I activities, the boundaries of Area 3A (Plate 2) are not well defined due to the paucity of wells in the area. Additional wells and sampling points are required to further delineate the extent of Area 3A. Impacts, if any, the Finch Lateral may have on the groundwater flow system and distribution of PCE in groundwater in the vicinity of Area 3A is not well understood. Installation of piezometers near the lateral will allow collection of groundwater levels to aid in the evaluation of whether the lateral acts as a groundwater divide. Collection of additional groundwater samples in the area will also aid in the evaluation of the impact of the lateral on PCE distribution. The geology near the northwest boundary of Area 2 will also be further evaluated to assess whether geologic differences could contribute to the distribution of PCE in Area 3A. If the proposed locations for monitoring wells, piezometers, or borings require modification due to access issues, the Department will be notified and alternative locations discussed.

2.1 Well Installation

To further evaluate chemical concentrations in groundwater near Area 3A, five borings will be drilled and completed as monitoring wells at the locations shown on Plate 2. Field activities will be conducted under the existing Site Safety Plan (*HLA, 1991*). If field conditions encountered during drilling prohibit use of the methods described below, the Department will be contacted and alternatives discussed. Boreholes for each monitoring well will be advanced to an approximate depth of 40 feet using hollow-stem auger drilling techniques. The boreholes will be lithologically logged by an HLA geologist and detailed field logs prepared. A monitoring well, consisting of an approximately 20-foot-long 0.010-inch, 2-inch diameter Schedule 40 PVC screen and approximately 20 feet of 2-inch diameter flush joint, threaded Schedule 40 PVC casing, will be constructed in each borehole. A sand pack will be emplaced around the well screen to approximately two to three feet above the top of the screen. A 2-foot-thick bentonite pellet seal will be constructed above the sand pack. Granular bentonite will be used to fill the remaining annulus. The well will be completed at grade with a bolted flush-mount well box and fitted with a locking cap.

Each monitoring well will be developed to promote groundwater flow to the well and to remove fine-grained material that may have been introduced to the well's filter pack. Well development will commence no sooner than 24 hours following completion of each well and will be accomplished by a combination of surging and bailing. The pH, specific conductivity, and temperature of the water removed from the well during development activities will be measured. Well development will be considered complete when these parameters stabilize and the purged water is essentially free of sediment.

Groundwater samples will be collected from each monitoring well and analyzed for halogenated VOCs using EPA Test Method 8010. Groundwater sampling will commence no sooner than 72 hours following well development activities and will be in accordance with the methods described in the QAPP (*HLA, 1992b*). Groundwater samples will be collected using either a stainless steel or teflon bailer after three well volumes of water have been removed from the well. The pH, specific conductance, and temperature of the groundwater will be measured as part of the sampling activities. All groundwater samples will be delivered under proper chain of custody procedures to Analytical Technologies Incorporated (ATI), located in Renton, Washington, for VOC analysis.

2.2 Hydropunch Sampling

To further evaluate PCE concentrations northwest of Area 3A, approximately four borings will be drilled and Hydropunch™ samples collected at the locations shown on Plate 2. The borings will be drilled using a hollow-stem auger drill rig to the top of the groundwater table. In-situ groundwater samples will then be collected from the boreholes using a Hydropunch™ sampler. Drilling will proceed to slightly above the target zone, the sampler will be driven into the zone, and the sample inlet opened, allowing groundwater to flow into the sample chamber. If lithologic conditions (e.g., the presence of gravel) prevent collection of groundwater samples with the Hydropunch sampler, samples will be collected by lowering a stainless steel bailer down the drill pipe to the bottom of the boring. The sampler or bailer will then be brought to the surface and the sample poured from the sample chamber into a laboratory-provided sample container.

The samples will be transported under proper chain of custody procedures to ATI, Renton, Washington, where they will be analyzed for VOCs using EPA Test Method 8010. Following sample collection, the boreholes will be backfilled to the ground surface using granular bentonite and cement grout.

2.3 Piezometer Installation

To further evaluate the impact of the Finch Lateral on PCE distribution in the PSA, five piezometers will be installed at the locations shown on Plate 2. The piezometers will allow the collection of groundwater levels near the lateral to evaluate whether localized groundwater mounding is occurring beneath the lateral and acting as a groundwater divide. The piezometers will be driven into the ground to an approximate depth of 25 feet. If lithologic conditions prevent driving the piezometers, the borings for the piezometers will be drilled using drilling techniques described above to an approximate depth of 25 feet. A piezometer consisting of a 5-foot-long 0.010-inch, 1-inch-diameter Schedule 40 PVC screen and 20 feet of 1-inch-diameter Schedule 40 casing will be constructed in each borehole. The remainder of the piezometers will be constructed as described in the monitoring well section (Section 2.1).

2.4 Staff Gauge Installation

To evaluate surface water levels in the Finch Lateral adjacent to the piezometer locations, staff gauges will be installed at three locations within the lateral. The locations will correspond to the piezometer locations shown on Plate 2. The staff gauges will be attached to a post that will be permanently installed in the bottom of the lateral.

2.5 Water Level Collection

The piezometers, monitoring wells, and staff gauges will be surveyed by a licensed surveyor to provide an elevation for the top of the casing and gauges. Groundwater levels will be collected from the piezometers and monitoring wells using either a chalked steel tape or a water level sounder. Surface water levels will be collected from the lateral by directly reading the level in the staff gauges. Water levels will be collected on a monthly basis for the first year following installation. However, water level collection will not delay the forward progress of the project.

2.6 Geophysical Investigation

To further evaluate the geology near the northwestern side of Area 2, an electrical resistivity survey or other appropriate geophysical technique will be conducted at the location shown on Plate 2. The resistivity survey will allow data collection to evaluate vertical and horizontal variations in soil type which may be causing a preferred pathway for groundwater flow.

Electrical resistivity methods measure the bulk resistivity of earth materials and are commonly used to evaluate soil type, rock type and quality, porosity, and pore-water properties (primarily conductivity). In the case of soils, variations in soil grain size and sorting influence the measured resistivity due to differences in the electrolytic connection taking place in connected pore spaces and along grain boundaries. Typically, resistivity values increase with increased grain size. That is, the measured resistivity of gravel is higher than sand, sand is higher than silt, and silt is higher than clay. A poorly-sorted soil will often exhibit a higher resistivity than a well-sorted soil of similar origin. For this study, HLA expects that lenses of courser grain soils (e.g., more permeable sand

and especially gravel) will have a higher resistivity than tighter, finer-grained soils.

HLA will use a combination of profiling and sounding techniques when measuring lateral and vertical variations in resistivity. The field data will be obtained using a four earth-contacting electrode arranged in two measurement dipoles called the dipole-dipole array. The technique involves measuring the apparent resistivity of the subsurface by injecting direct current into the ground using a pair of current electrodes and measuring the electrical potential (voltage) by an adjacent pair of electrodes. The dipole-dipole sounding provides information about how the resistivity of the soil varies with depth and is conducted by varying the distance between a stationary current electrode pair and ever-expanding potential electrode pairs. The magnitude of this depole-dipole expansion determines the total depth of the investigation. Lateral variations in resistivity is evaluated by performing the dipole-dipole expansions along a profile. The resistivity data obtained from the combined sounding and profiling procedure is plotted to produce what is termed an apparent resistivity pseudosection. These data are contoured and computer processed to produce a cross-sectional earth model showing the lateral and vertical distribution of apparent resistivity.

3.0 SCHEDULE

Field work is scheduled to begin within 2 weeks of Department approval of this Work Plan. Actual drilling dates may vary because of the availability of drilling subcontractors, access negotiations, and/or permitting issues. VW&R has initiated efforts to gain access to properties through identification of property owners. Following completion of all Phase II field work and receipt of final analytical data, the results will be submitted to the Department in a Phase II report, and incorporated into the PSA Risk Assessment.

4.0 REFERENCES

Harding Lawson Associates (HLA), 1991. *Site Safety Plan, VW&R Boise, Boise. Idaho.* August 20.

_____, 1992a. *Exhibit #1, Work Plan, Preliminary Study Area Investigation, Boise, Idaho.* September 8.

_____, 1992b. *Quality Assurance Project Plan, Former VW&R Facility, Boise, Idaho.* November 2.

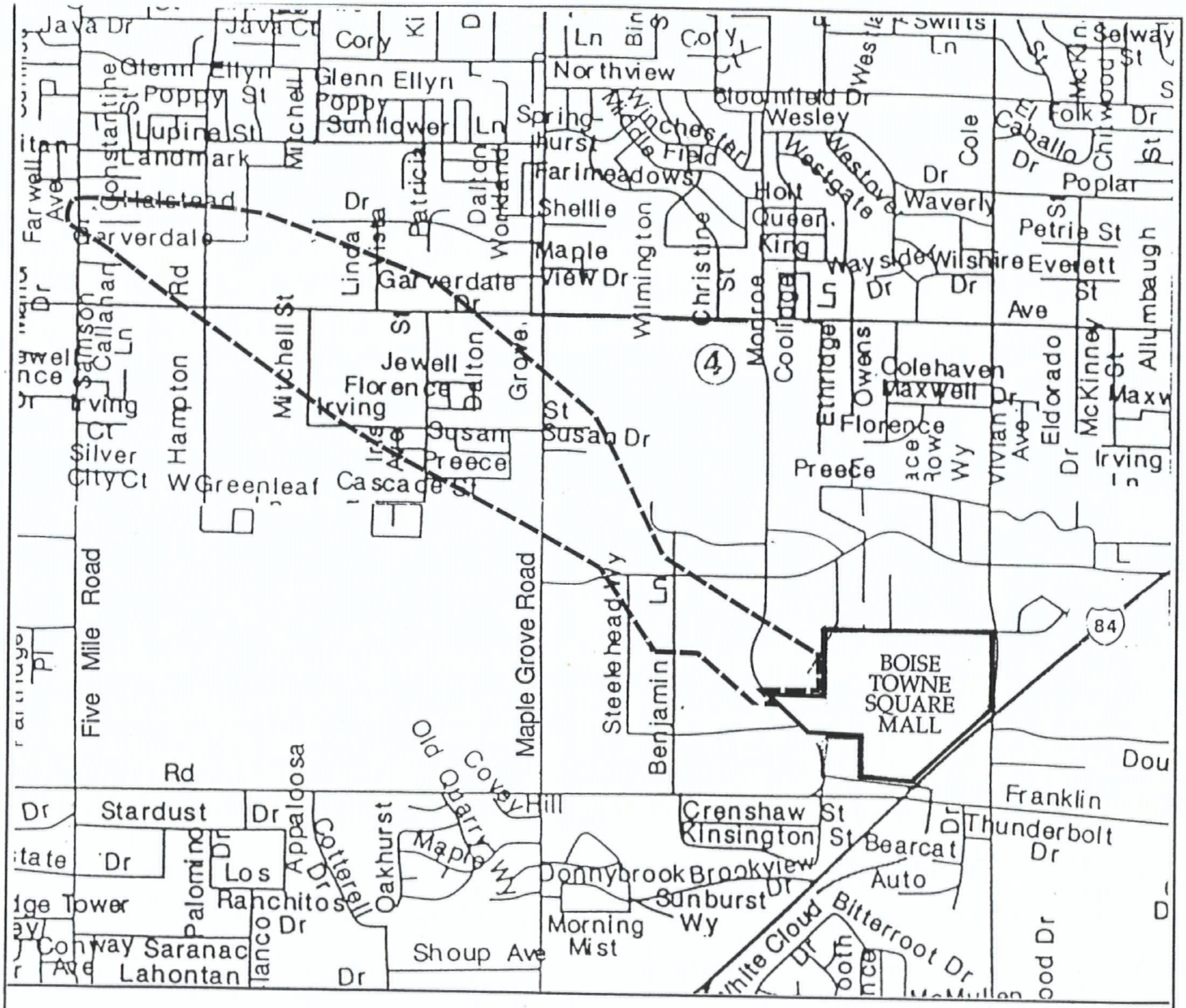
_____, 1994. Draft Final Site Investigation Report/Remedial Action Plan, Boise Towne Square Mall. Boise, Idaho. November 2.

_____, 1995. *Draft Site Investigation Report, Preliminary Study Area Boise, Idaho.*

Idaho Department of Health and Welfare Division of Environmental Quality (Department), 1992. *Preliminary Study Area Consent Order between Van Waters & Rogers Inc. and the Department.* October 9.

PLATES

PLATES



Reference: U.S> West Communications telephone book, Boise, Idaho, 1990-91.

EXPLANATION

Mall Investigation Area

Affected Area

0 0.5

APPROXIMATE SCALE IN MILES

N

Harding Lawson Associates Engineering and Environmental Services		**Affected Area** Phase II Work Plan Boise, Idaho		PLATE **1**
DRAWN CSN	JOB NUMBER 20783 007	APPROVED SMB	DATE 3/93	REVISED DATE

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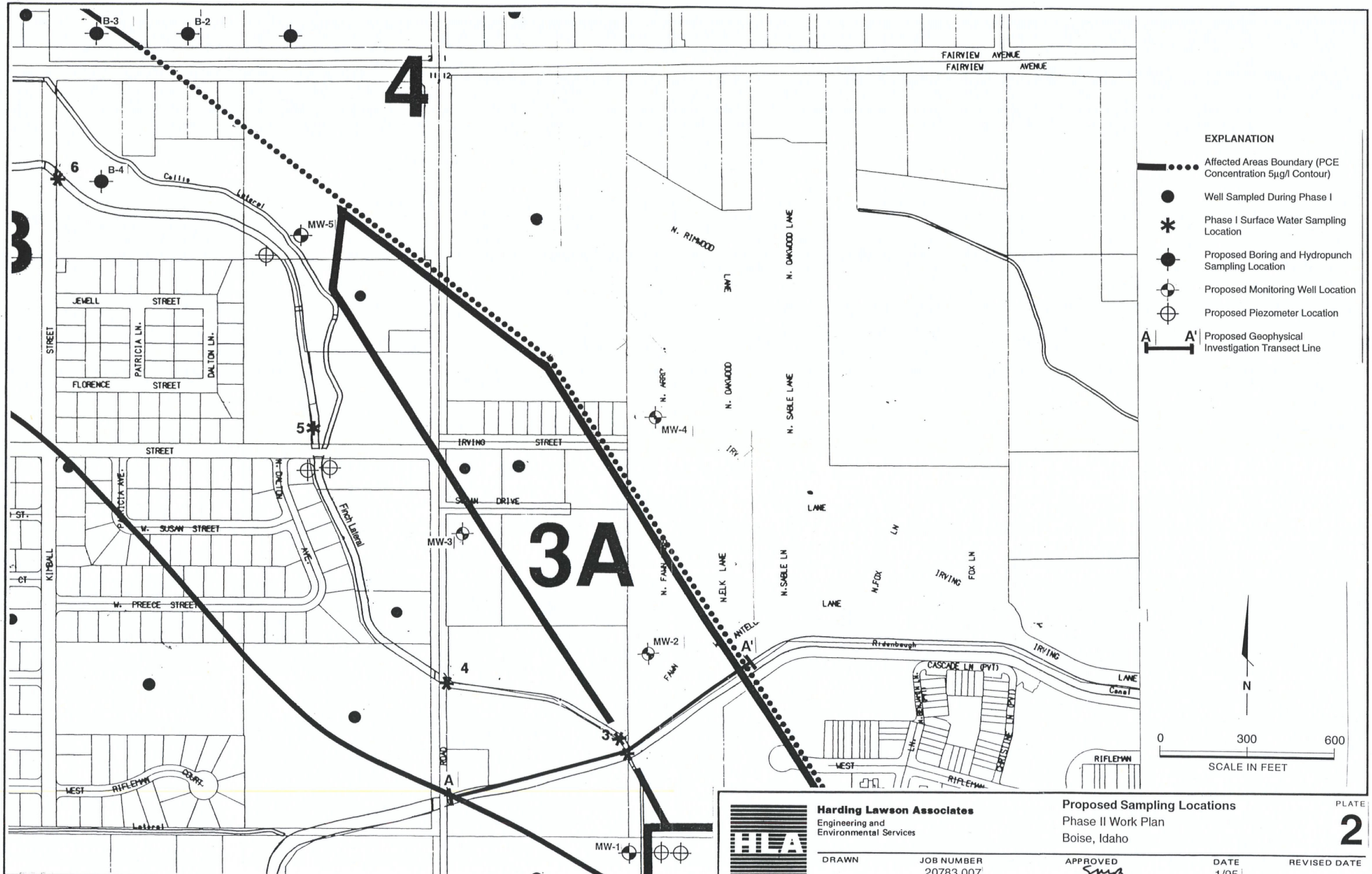

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Proposed Sampling Locations
Phase II Work Plan
Boise, Idaho

PLATE **2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
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